1895MNRAS..56...70R

By the application of the corrections for eccentricity and longitude of perigee, the outstanding corrections become, therefore, corrections of a sensibly progressive character throughout the year under consideration. These progressive corrections arise doubtless from differences in the tables of perturbations given by Newcomb and Le Verrier respectively.

Photograph of the Spiral Nebula M. 33 *Trianguli.*

By Isaac Roberts, D.Sc., F.R.S.

The photograph of the spiral nebula M. 33 *Trianguli*, R.A. $1^h\ 28^m$, Decl. $30^\circ\ 7'$ north, was taken with the 20-inch reflector on 1895 November 14, with exposure of the plate during 2 hours and 15 minutes, and the copy now presented is enlarged to the scale of 1 millimetre to 24 seconds of arc.

The nebula is N.G.C. No. 598, G.C. No. 352, h 131, Rosse, *Obs. of Neb. and Cl. of Stars*, p. 20; *Phil. Trans.* 1850, pl. 36, fig. 5, and 1861 pl. 36, fig. 10.

Sir J. Herschel (G.C. 352) describes the nebula as a remarkable object, extremely bright, extremely large, round, very rich, very gradually brighter in the middle with a nucleus, and resolvable.

Lord Rosse (references given above) has recorded 32 observations made between the years 1849 and 1862, and gives a marginal sketch. These make us acquainted with the difficulties encountered by the observers in their efforts to make intelligible, by descriptive matter and by drawings, an object having a structure so complex that no eye and hand, however well trained, could possibly delineate it.

The photograph shows the nebula to be a spiral with remarkable features. The nebula measures about 62 minutes of arc from *north following* to *south preceding*, and 35 minutes from *south following* to *north preceding*.

It will be observed that there are two large, very prominent, spiral arms, with their respective external curvatures facing north and south, and that the curves are approximately symmetrical from their extremities to their point of junction at the centre of revolution, where there is a nebulous star of about tenth magnitude with dense nebulosity surrounding it, and elongated in *north* and *south* directions. Involved in this nebulosity are three bright stars and several faint nebulous stars; the two arms also are crowded with well-defined stars and faint nebulous stars with nebulosity between them; and it is to the combined effect of these that the defined forms of the arms are due. Besides these two arms there are subsidiary arms, less well defined, and likewise trending towards the centre of revolution, and are constituted of interrupted streams of faint stars and nebulosity intermingled

1895MNRAS..56...70R

together; many of the stars are nebulous and many are well defined but small. The interspaces between the convolutions are more or less filled with faint nebulosity, having curves, rifts, fields, and lanes, without apparent nebulosity in them. They are like the interspaces in clouds of smoke, and cannot be classified.

There are outliers of nebulosity with many small well-defined and nebulous stars involved in them, and there are also isolated nebulous stars on the extreme boundaries of the nebula; but the evidence is strong that they are all related to the nebula.

It is by the study of the photographs, and not by descriptive matter, that we can form a true conception of the character of this nebula; from which we shall be justified, even now, in drawing some inferences as to its formation and further developments. To this end I may be permitted to suggest the following.

We know, with a reasonable amount of certainty, that both nebulous and meteoric matters exist in space; and we also have some evidence that bodies in space have come into collision.

From these premises we may infer that this nebula is the result of a collision of some kind; and we can imagine collisions of at least three kinds possible; namely, (1) between two stars, (2) between two nebulæ, (3) between two swarms of meteorites.

In the case of this nebula, which (if any) of the three possibilities mentioned seems to us the one most probable to have happened? Much might be said in favour of each of these suggestions, but I shall not at present enter into details, though I think we could readily imagine that the collision of two swarms of meteorites, moving in opposite directions, one from the *south following* and the other from the *north preceding*, would account for the spiral appearance, the rotary motion, and the smashed and scattered state in which the nebula is shown to us upon the photographs.

Two photographs of the nebula have been taken, one on 1891 November 11, and the present photograph on November 14 (last month). I have examined these with some care, and found all the stars and the nebulosity, on both plates, to be sensibly coincident, after the lapse of an interval of four years; and unless the object were comparatively near to us, this result is what we should expect to find.

The spiral nebulæ M. 101 *Ursæ Majoris* and M. 74 *Piscium*, photographs of which we will now project on the screen, are very similar in character to M. 33 *Trianguli*; but they are more symmetrical in outline, and appear to have arrived at a more advanced stage in their development. Another inference which may fairly be drawn is, that upon photographs of spiral nebulæ, and of globular clusters, we shall first find conclusive evidence of structural changes taking place, together with the import of such changes; though a period of four years is too short to enable us to prove that any obvious change has taken place in the spiral nebula M. 33 *Trianguli*.

1895MNRAS..56...70R

On the Proper Motion of Lacaille, 4336, *Mag.* 5·5.

By R. T. A. Innes.

This star (R.A. $10^{h}\ 26^{m}\ 42^{s}$, Dec. −53° 6′, 1880) with a 8·2 mag. companion (Cordoba Zones 10^{h}, 1929) makes the pair *h* 4329 of which I have found the following measures :

	°	″		
1837·1	17·1	17·5	*h*	2 nights
1846·3	29·6	17·5	Jacob	
1873·2	63·7	21·9	Russell	1 night
1881·5	71·7	23·4	Hargrave	„

This star is sometimes called *Y Velorum* : it is a white star, the *comes* being red, according to *h* and Russell.

The change of position is well accounted for by applying to Lac. 4336 a proper motion of 0″·44 towards 297°·5, or R.A. $-0^{s}{\cdot}043$ Dec. +0″·203. This proper motion is not too inconsistent with the positions I have at hand, viz. the B.A.C., the A.G.C., and Stone's Cape Catalogue.

It has occurred to me that, if Mr. Stone were asked, he would kindly supplement my remarks with a comparison of the meridian observations, which might be somewhat reconciled with each other now that we have an independent determination of the proper motion.

Sydney : 1895 *November* 1.

Mr. Innes's conclusion that the alterations in position angle and distance of these two stars are principally due to the proper motions of the star, Lacaille 4336, appears to me quite correct. I find on reference to my manuscript of proper motions that the principal star has proper motions of about $-0^{s}{\cdot}051$ in R.A. and −0″·16 in N.P.D. The first depends entirely upon a comparison between Taylor and Stone, and probably requires a correction of about $+0^{s}{\cdot}005$ on account of systematic errors of Taylor's R.A. The proper motion in N.P.D. depends on comparisons between Stone and four other catalogues.—E. J. STONE.